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(71) Applicant:

000000099
Ishikawajima Harima Heavy Industries KK
2-2-1 Otemachi
Chiyoda-ku
Tokyo-to
Japan

(72) Inventor:

Akio Hirano
Yokohama Engineering Center
Ishikawajima Harima Heavy Industries KK
1 Shinakahara-cho
Isogo-ku
Yokohama-shi
Kanagawa-ken
Japan

(74) Agent

100087527
Mitsuo Sakamoto, Patent Attorney
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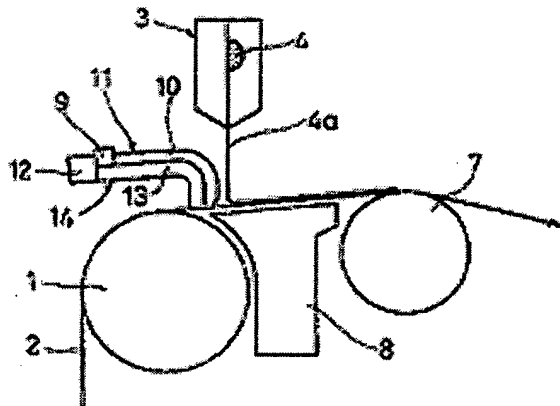
(54) Title of the Invention An air-shuttering device for a curtain coater

(57) Abstract

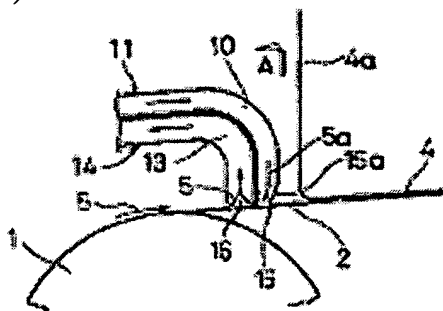
[Problem] To prevent the turbulence of a curtain profile by protecting a curtain of coating color from air to be drawn and carried by a base paper.

[Means of Solution] In a curtain coater for applying a coating color 4 that is caused to flow down as a curtain 4a from a liquid feed head 3 onto the surface of a base paper 2 that is wound around and travels on a coater roll 1, an air blowing machine 11 and an air sucking machine 14 are arranged on the upstream side of a coating color flow down position so that they are along the width direction of the curtain 4a. An air blowing port 15 of an air blowing nozzle 10 that is provided in the air blowing machine 11 is guided to the front of the coating color flow down position and arranged so as to closely approach the base paper 1 in a non-contact state. An air sucking port 16 of an air sucking nozzle 13 that is provided in the air sucking machine 14 is positioned such that it is adjacent to the upstream side of the air blowing port 15 of the air blowing nozzle 10 and arranged so as to closely approach the base paper 2 in a non-contact state.

(a)



(b)



[Scope of Patent Claims]

[Claim 1] An air-shuttering device for a curtain coater, which is configured such that, in a curtain coater for applying a coating color by causing it to flow down in a curtain shape from a liquid feed head onto the surface of base paper that is wound around and travels on a coater roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from the above-mentioned liquid feed head to the base paper surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the base paper surface, and the air that is blown to the base paper surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the base paper.

[Claim 2] An air-shuttering device for a curtain coater, which is configured such that, in a curtain coater for applying a coating color to a base paper surface by causing it to flow down in a curtain shape onto the surface of an applicator roll, a coating color is applied by causing it to flow down in a curtain shape from a liquid feed head onto the surface of an applicator roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from said liquid feed head to the applicator roll surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the applicator roll surface, and the air that is blown to the applicator roll surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the surface of the applicator roll.

[Claim 3] The air-shuttering device for a curtain coater described in Claim 1 or Claim 2, wherein the downstream side rim part of the air blowing port of the air blowing nozzle is flexed to the upstream side, and the air that is blown is redirected to the upstream side.

[Claim 4] The air-shuttering device for a curtain coater described in Claim 1 or Claim 2, wherein the upstream side rim part of the air blowing port of the air blowing nozzle and the downstream side rim part of the air sucking port of the air sucking nozzle are made shorter than the downstream side rim part of the air blowing port and the upstream side rim part of the air sucking port, and the continuous connecting part between the air blowing port and air sucking port is made broader.

[Claim 5] The air-shuttering device for a curtain coater described in Claim 1 or Claim 2, wherein the air blowing port of the air blowing nozzle of the air sucking port of the air sucking nozzle are placed facing downward at a slant so that they face the upstream side.

[Detailed Explanation of the Invention]

[0001]

[Technical Field to Which the Invention Pertains] The present invention relates to an air-shuttering device for a curtain coater that applies a coating color to base paper that is manufactured in a paper-making factory.

[0002]

[Prior Art] There are many cases where the paper manufactured in a paper-making factory is not used immediately in that form, but rather is made into processed paper as a product that is adapted to the required purpose by applying further processing to it as a base paper. There are many kinds of processed paper, but one of these is paper processed with a coating. Coated processed paper is manufactured by applying a coating color (coating liquid) to the surface of the paper, and a curtain coater is known as one of the devices thereof.

[0003] As shown in the overview of the curtain coater in Figure 8, the curtain coater is configured such that said coating color 4 is directly applied on the base paper 2, by causing the coating color 4 to flow down as a coating liquid from the liquid feed head 3 as a uniform curtain 4a, onto the surface of the base paper 2 that is wound around a coater roll 1, and that travels in a slightly upward direction facing the downstream from said coater roll 1.

[0004] In the above-mentioned curtain coater, the curtain 4a of the coating color 4 is thin, so it is swayed even if slight wind pressure acts on it and the profile is disordered, and the application surface deteriorates and this in turn causes the product quality to decline. On the other hand, in recent years, the operation of applying the coating color 4 to the surface of the base paper 2 with the above-mentioned curtain coater has been made a higher speed operation, but when it reaches the point where the base paper 2 is caused to travel at a high speed such that it exceeds 600 m/min, there occurs the problem that the wind pressure of the air 5 of the base paper surface layer that has been drawn and carried (made to accompany) by the traveling of this base paper 2 sways the curtain 4a of the coating color 4, and the application surface is adversely affected. Given this, conventionally a scraper-like air-shuttering blade 6 has been inclined such that it faces downwards towards the traveling direction of the base paper 2 and the front end thereof (the lower end) is disposed in close contact with the surface of the base paper 2, on the upstream side position of the curtain 4a of the coating color 4, that is, above the base paper 2 on the upstream side position of the liquid feed head 3, and the air 5 of the base paper layer that is drawn and caused to accompany due to the traveling of the base paper 2 is shuttered such that it is scraped down from the base paper 2 surface by the blade 6 at the upstream side position of the flow down position of the coating color 4, and the turbulence of the curtain profile of the coating color 4 is prevented by the wind pressure of the above-mentioned accompanying air 5.

[0005] 7 stands for the guide roll that is disposed on the downstream side of the flow down position of the coating color 4, and 8 is the color pan for collecting the coating color 4 that has flowed down from the width end of the base paper 2 during coating.

[0006]

[Problems That the Invention Attempts to Solve] However, the above-mentioned conventional air-shuttering mode is configured such that the tip of the blade 6 is in contact with the surface of the base paper 2 and the air 5 of the surface of the base paper 2 is scraped, so paper dust is generated due to the friction of the base paper 2 traveling at

high speed and the blade 6, said paper dust accumulates on a portion of the blade 6, and from time to time the paper dust that has accumulated on a portion of the blade falls on the base paper 2, so there is the problem that defects occur in the product. In addition, since the blade 6 wears out, it is necessary to replace it periodically.

[0007] Accordingly, the present is configured such that it provides an air-shuttering device for a curtain coater that can shutter the air that accompanies the base paper or roll immediately before the downstream position of the coating color, without generating any paper dust, and can prevent turbulence of the curtain profile of the coating color.

[0008]

[Means for Solving the Problems] In order to solve the above-mentioned problems, the present invention comprises an air-shuttering device for a curtain coater, which is configured such that, in a curtain coater for applying a coating color by causing it to flow down in a curtain shape from a liquid feed head onto the surface of base paper that is wound around and travels on a coater roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from the above-mentioned liquid feed head to the base paper surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the base paper surface, and the air that is blown to the base paper surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the base paper, and is configured such that a coating color is applied by causing it to flow down in a curtain shape from a liquid feed head onto the surface of an applicator roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from said liquid feed head to the applicator roll surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the applicator roll surface, and the air that is blown to the applicator roll surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the surface of the applicator roll.

[0009] When the air that is carried along with the traveling of the base paper or the rotation of the applicator roll reaches a point just before the downstream position of the coating color, said air is shuttered by the air that is blown through the air blowing nozzle, and is sucked through the air sucking nozzle along with said blown air, so it is possible to prevent turbulence from being imparted to the curtain profile of the coating color.

[0010] In addition, the air-shuttering device for a curtain coater is configured such that the downstream side rim part of the air blowing port of the air blowing nozzle is flexed to the upstream side, and the air that is blown is redirected to the upstream side, and owing

to this it is possible to make the air sucking nozzle effectively suck the air that is shuttered from the air sucking port.

[0011] In addition, the air-shuttering device for a curtain coater is configured such that the upstream side rim part of the air blowing port of the air blowing nozzle and the downstream side rim part of the air sucking port of the air sucking nozzle are made shorter than the downstream side rim part of the air blowing port and the upstream side rim part of the air sucking port, and the continuous connecting part between the air blowing port and air sucking port is made broader, and owing to this the air that is blown through the air blowing nozzle can be circulated around more easily to the inside of the air sucking nozzle, and the latter can be made to suck more effectively.

[0012] Moreover, the air-shuttering device for a curtain coater is composed such that the air blowing port of the air blowing nozzle of the air sucking port of the air sucking nozzle are placed facing downward at a slant so that they face the upstream side, and owing to this it is possible to push back directly the accompanying air from the front to the upstream side, and to shutter and suck effectively.

[0013]

[Mode of Embodiment of the Invention] A description of a mode of embodiment of the present invention is provided below with reference to figures.

[0014] Figure 1(a) and (b) show one mode of embodiment of the present invention. Just as in the case of Figure 8, which showed one example of the same, in a curtain coater for applying a coating color 4 by causing it to flow down in a curtain 4a shape from a liquid feed head 3 onto the surface of base paper 2 that is wound around and travels on a coater roll 1, an air blowing machine 11, which comprises an air blowing duct 9 that is connected to an air supply source (not shown) and a flat box-shaped air blowing nozzle 10 that is continuously connected through to said air blowing duct 9, and an air sucking machine 14, which comprises an air sucking duct 12 that is connected to an air supply source (not shown) and a flat box-shaped air sucking nozzle 13 that is continuously connected through to said air sucking duct 12, are installed further above the base paper 2 of the upstream side than the flow down position of the above-mentioned coating color 4, and the device is configured such that the air 5a that is blown onto the surface of the base paper 2 from the air blowing nozzle 10 and the air 5 that comes with the base paper 2 are sucked from the air sucking nozzle 13.

[0015] To describe it in more detail, the air blowing port 15 at the tip of the above-mentioned air blowing nozzle 10 is formed in a longish manner in a slit shape along the width direction of the curtain 4a, and said air blowing nozzle 15 is disposed such that it is in a non-contact state on the base paper 2 by maintaining a slight gap on the surface of said base paper 2 facing the perpendicular direction, and in addition the air sucking nozzle 13 is disposed on the upstream side of said air blowing nozzle 10 such that at least the air sucking port 16 at the tip is in contact with the air blowing port 15 of the above-mentioned air blowing nozzle 10, and the air sucking port 16 is formed in a slit shape along the width direction of the curtain 4a in parallel with the air blowing port 15, and moreover is placed in a non-contact state facing the perpendicular direction on the surface of the base paper 2, and in addition the downstream side wall of the above-mentioned air blowing nozzle 10 is placed in a position within 30 mm of the upstream side of the curtain 4a, and the device is configured such that the air 5 just before it

reaches the curtain 4a is shuttered by the air 5a that is blown from the air blowing nozzle 10 and the air sucking nozzle 13 is caused to suck it.

[0016] The air sucking force of the above-mentioned air sucking nozzle has the ability to suck the air 5a that is blown from the air blowing nozzle 10, and moreover has been made adjustable in several stages so that it can respond to the changes in the air amount due to the traveling speed of the base paper 2, and has been configured such that for example when the sucking amount is set at Q_1 and the blowing amount is set at Q_2 , it is employed as $Q_1 \geq \text{about } 1.5 Q_2$.

[0017] In addition, a composition wherein the above-mentioned air blowing nozzle 10 is continuously connected through to the entire paper width direction is acceptable, but as shown in the example in Figure 2, it may also have a composition wherein the interior is divided into the required intervals of the paper width direction by a divider plate 10a used for dispersal that is configured such that it extends from the air blowing duct 9 to the position on the near side of the air sucking port 15.

[0018] During the operation of the curtain coater, when the air 5 of the base paper surface layer that is drawn and carried by the traveling base paper 2 approaches the flow down position of the coating color 4 and tries to pass through the position of the air blowing port 15 of the air blowing nozzle 10 and the air sucking port 16 of the air sucking nozzle 13, the above-mentioned layer of the accompanied air ends up being broken by the air 5a that is blown from the air blowing port 15 from the air blowing duct 9 through the air blowing nozzle 10, and moreover the shuttered air 5 ends up being sucked by the air sucking duct 12 through the air sucking nozzle 13 along with the blown air 5a. Therefore, the wind of the accompanying air 5 does not strike the curtain 4a of the coating color 4, so it is possible to prevent turbulence of the curtain profile.

[0019] In the foregoing, when the air blowing port 15 that faces the curtain side of the air blowing nozzle 10 is configured such that the downstream side rim part 15a is inclined over the entire length towards the upstream side, the air 5a that is blown from the air blowing port 15 of the air blowing nozzle 10 is redirected so that it faces the upstream side, so it is possible to make the air sucking nozzle 13 effectively suck the shuttered air 5 from the air sucking port 16. In addition, the air blowing port 15 of the air blowing nozzle 10 is disposed at a position within 30 mm of the near side of the application position that serves as the position where the curtain 4a of the coating color 4 flows down, and given this accompaniment by new air such that turbulence is imparted to the curtain profile does not occur at all on the downstream side of the air blowing port 15 of the air blowing nozzle 10.

[0020] In this manner, the device is configured such that the accompanying air 5 is sucked while the air 5a is blown, so there is no sucking of the base paper 2, and moreover the accompanying air 5 can be shuttered in a non-contact mode, so no paper dust is generated during air shuttering, and moreover there are no consumable parts such as the blade.

[0021] Next, Figure 3 shows another mode of embodiment of the present invention. In a composition that is similar to that shown in Figure 1(a) and (b), the upstream side rim part 15b of the air blowing port 15 of the air blowing nozzle 10 and the downstream side rim part 16a of the air sucking port 16 have been made short, and the continuous connection part 17 of the air blowing port 15 and the air sucking port 16 has been widened.

[0022] In the event that the device is configured as shown in Figure 3, the downstream side rim part 15 of the air blowing port 15 of the air blowing nozzle 10 does not deviate towards the upstream side, but the lengths of the rim parts 15b and 16a of the portion that is located at the boundary between the air blowing nozzle 10 and the air sucking nozzle 13 have become shorter, the continuous connection part 17 of the air blowing port 15 and the air sucking port 16 has become wider, so the air 5a that is blown through the air blowing nozzle 10 can be circulated around more easily to the inside of the air sucking nozzle 13, and operational effects that are identical to those of the case of the above-mentioned mode of embodiment can be achieved without hardly any leakage of the blown air 5a to the upstream side.

[0023] Next, Figure 4 shows yet another mode of embodiment of the present invention. In a composition that is similar to that shown in Figure 1(a) and (b), the air blowing port 15 and the air sucking port 16 are disposed towards the upstream side, such that the air 5a is blown at an incline and caused to be sucked in at an incline.

[0024] When the device is configured as shown in Figure 4, it is possible to blow the air 5a through the air blowing nozzle 10 towards the upstream side, so it can be configured such that the air 5 that is drawn and carried by the traveling base paper 2 is pushed back directly from the front to the upstream side, and therefore it is possible to shutter and suck it effectively even when it is the air 5 of base paper 2 with a high traveling speed.

[0025] Next, Figure 5 shows yet another mode of embodiment of the present invention. In a composition that is similar to that shown in Figure 1(a) and (b), the combination of the air blowing machine 11 and the air sucking machine 14 is disposed in two groups in proximity along the traveling direction of the base paper, instead of a 1 group combination of the air blowing machine 11 and the air sucking machine 14 being used.

[0026] When the device is configured as shown in Figure 4, it is possible to shutter continuously the air 5 along the 2 stages in the traveling direction of the base paper 2, so it is possible to handle a further increase in the speed of the coating operation.

[0027] Figure 6 shows yet another mode of embodiment of the present invention, and it has been configured such that air shuttering is done in a device that enables two-layer coating of the coating color 4. That is, in a curtain coater for coating by causing coating colors to flow down respectively as curtains 4a by means of two liquid feed heads 3, which are disposed by separating them by the required interval along the traveling direction of the base paper [2], onto the surface of the base paper 2 that is wound around and travels on the coater roll 1, an air blowing machine 11 and an air sucking machine 14 have been respectively disposed as is shown in Figure 1(a) and (b) on the upstream side of the flow down position of the coating colors of the respective liquid feed heads 3.

[0028] When a configuration like that shown in Figure 6 is adopted, the combination of the two-stage air blowing machine 11 and air sucking machine 14, which are disposed along the traveling direction of the base paper 2, is a non-contact mode for both of them, so the air 5 can be shuttered at the upstream side position of the application surface of the coating colors 4 that flow down from the liquid feed heads 3 of the upstream side, and it is possible to shutter the air in a non-contact manner by the action of the air blowing machine 11 and air sucking machine 14 on the downstream side, even in the case of an application surface where the coating colors 4 flow down from the liquid feed heads 3 of the upstream side. Owing to this, it becomes possible apply a top coat of a coating color 4 at the downstream side thereof before the coating color 4 that has been applied on the

upstream side has dried, and it is thus possible to aim at greater efficiency in the application operation.

[0029] Moreover, Figure 7 shows an example of the present invention's adoption for another type of curtain coater. In a curtain coater that is configured such that the base paper 2 passes between a pair of applicator rolls that are disposed levelly and in parallel, and that applies coating color 4 that flows down in a curtain 4a shape from a liquid feed head 3 onto the surface of both (or one of the) applicator rolls by transfer from the roll surface to the surface of the base paper 2, a combination of an air blowing machine 11 and an air sucking machine 14 that is composed in the same manner as shown in Figure 1(a) and (b) are disposed in a non-contact state on the upstream side of the flow down position of the coating color, with the air blowing port 15 and the air sucking port 16 at the tip parts of each nozzle 10 and 13 in proximity to the surface of the applicator roll 18.

[0030] In a case like that shown in Figure 7 as well, the air 5 that is drawn by the rotational movement of the applicator roll 18 and carried to the point just before the flow down position of the coating color can be shuttered in a non-contact manner by the air blowing machine 11 and the air sucking machine 14.

[0031] The present invention is not limited to only the above-mentioned modes of embodiment, and a combination of an air blowing machine 11 and an air sucking machine 14 that has the nozzle configuration that is shown in Figure 3 or Figure 4 may be applied to the mode of embodiment in Figure 5, Figure 6 or Figure 7, and in addition it goes without saying that a variety of modifications can be added within a scope that does not deviate from the gist of the present invention.

[0032]

[Effects of the Invention] As described above, according to the air-shuttering device for a curtain coater, in a curtain coater for applying a coating color by causing it to flow down in a curtain shape from a liquid feed head onto the surface of base paper that is wound around and travels on a coater roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from the above-mentioned liquid feed head to the base paper surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the base paper surface, and the air that is blown to the base paper surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the base paper, and is configured such that a coating color is applied by causing it to flow down in a curtain shape from a liquid feed head onto the surface of an applicator roll, an air blowing nozzle whose air blowing port is made longer along the width direction of the curtain of the coating color, and the air sucking nozzle whose air sucking port is made longer along the width direction of the curtain of the coating color, are disposed in a single or in multiple stages in a row such that said air sucking nozzle is on the upstream side, on the upstream side position of the flow down position of the coating color from said liquid feed head to the applicator roll surface, and in addition the air blowing port of the above-mentioned air blowing nozzle closely approaches the

curtain of the coating color, the air blowing port and the air sucking port are fixed in close proximity to the applicator roll surface, and the air that is blown to the applicator roll surface from the air blowing port of the air blowing nozzle can be sucked in from the air sucking port of the air sucking nozzle along with the air that comes with the surface of the applicator roll, so the air that is carried along towards the flow down position of the coating color due to the traveling of the base paper or the rotation of the applicator roll can be shuttered by the air that is blown from the air blowing port, at the position just before it, and can be sucked by the air sucking nozzle along with said shuttered air, and it is possible to prevent turbulence from being imparted to the curtain profile by the wind of the accompanying air before it happens. At this time, since the air blowing port and the air sucking port are in a non-contact state on base paper or roll surface, no paper dust is generated as in the case of the contact-type blade, so no defects end up being produced in the products due to the falling of paper dust. In addition, the air-shuttering device for a curtain coater is configured such that the downstream side rim part of the air blowing port of the air blowing nozzle is flexed to the upstream side, and the air that is blown is redirected to the upstream side, so it is possible to make the air sucking nozzle effectively suck the air that is shuttered from the air sucking port. Moreover, the air-shuttering device for a curtain coater is configured such that the upstream side rim part of the air blowing port of the air blowing nozzle and the downstream side rim part of the air sucking port of the air sucking nozzle are made shorter than the downstream side rim part of the air blowing port and the upstream side rim part of the air sucking port, and the continuous connecting part between the air blowing port and air sucking port is made broader, so the air that is blown through the air blowing nozzle can be circulated around more easily to the inside of the air sucking nozzle, and the latter can be made to suck more effectively. Moreover, the air-shuttering device for a curtain coater is composed such that the air blowing port of the air blowing nozzle of the air sucking port of the air sucking nozzle are placed facing downward at a slant so that they face the upstream side, and owing to this it is possible to push back directly the accompanying air from the front to the upstream side, and to shutter and suck effectively. The above are some of the superior effects that are realized by the present invention.

[Brief Description of the Figures]

[Figure 1] Since Figure 1 shows one mode of embodying the air-shuttering device of the curtain coater, which is the present invention, Figure 1(a) is a schematic diagram of the whole.

Figure 1(b) is an enlarged view of the main parts.

[Figure 2] Figure 2 is an oblique view of the air blowing nozzle viewed from direction A of Figure 1(b).

[Figure 3] Figure 3 is a partial view that shows another mode of embodiment of the present invention.

[Figure 4] Figure 4 is a schematic diagram that shows yet another mode of embodiment of the present invention.

[Figure 5] Figure 5 is a schematic diagram that shows yet another mode of embodiment of the present invention.

[Figure 6] Figure 6 is a schematic diagram that shows yet another mode of embodiment of the present invention.

[Figure 7] Figure 7 is a diagram showing an example of adoption for a different model of curtain coater.

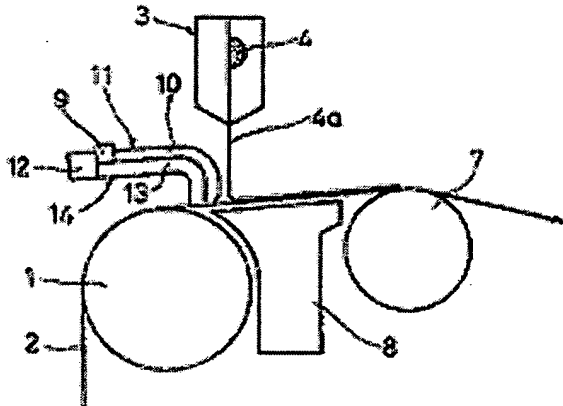
[Figure 8] Figure 8 is a schematic diagram of one example of a curtain coater.

[Key]

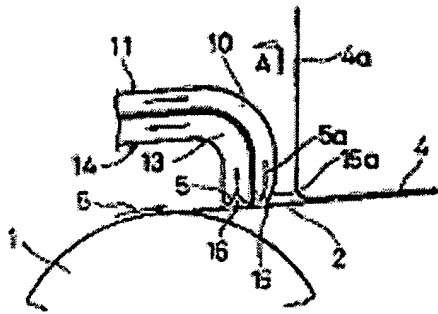
- 1... Coater roll
- 2... Base paper
- 3... Liquid feed head
- 4... Curtain for applying coating color
- 4a... Curtain
- 10... Air blowing nozzle
- 11... Air blowing machine
- 13... Air sucking nozzle
- 14... Air sucking machine
- 15... Air blowing port
- 15a... Downstream side rim part
- 15b... Upstream side rim part
- 16... Air sucking port
- 16a... Downstream side rim part
- 17... Continuous connecting part
- 18... Applicator roll

[Figure 1]

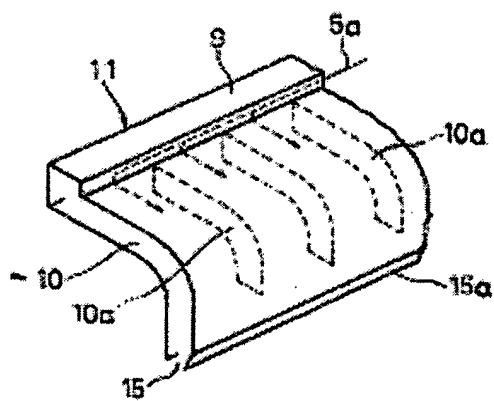
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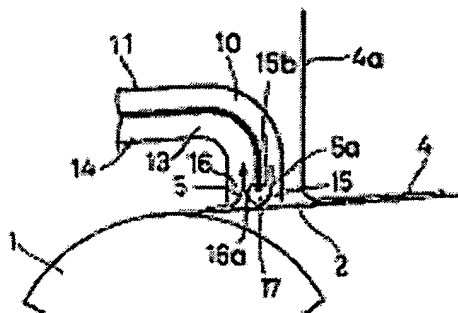
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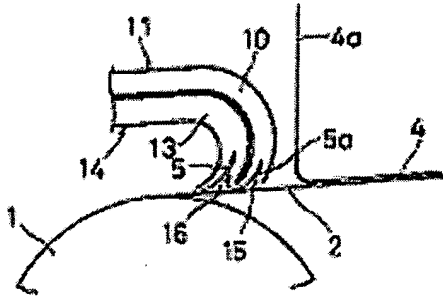
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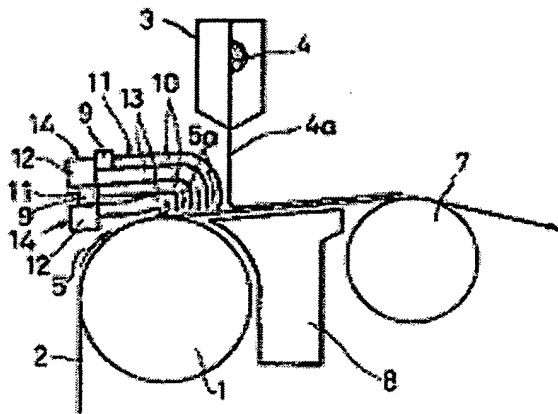
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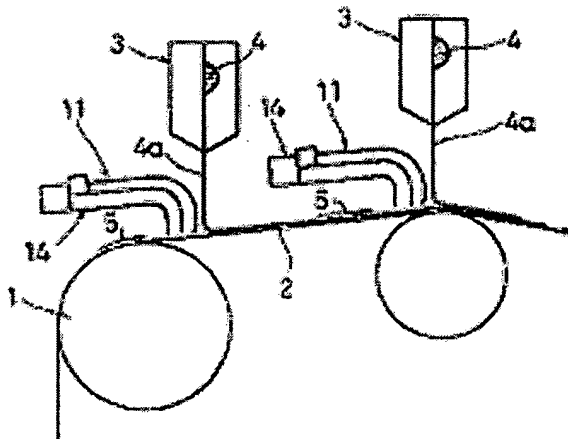
[Figure 4]



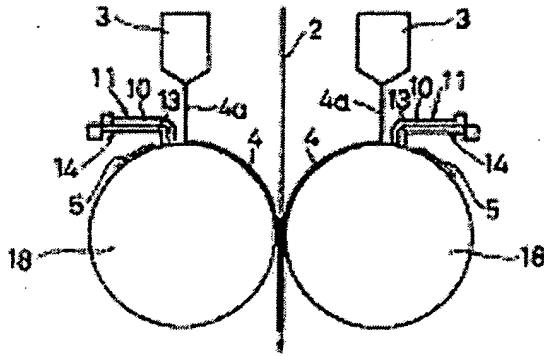
[Figure 5]



[Figure 6]



[Figure 7]



[Figure 8]

